

Claims 1-47 are pending in the present application. Claims 1-47 were rejected in the Office Action dated April 7, 1997.

Claims 1-47 were rejected in paragraph 2 of the Office Action under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicants regard as their invention.

Regarding claim 1, the Examiner indicated that the step of "applying pulsed light" does not indicate to what the light is applied. Claim 1 has been amended to indicate that the light is applied to a surface of the region of wrinkled skin. The Examiner further did not understand whether the claimed steps of heating and shrinking collagen were individual steps or were merely the results of the applying step. Claim 1 has been amended to clarify this misunderstanding. The Examiner rejected claim 1 as reciting the result of the process. Claim 1 has been amended accordingly.

Regarding claim 5, the Examiner stated that ice is not a transparent substance. The Applicants disagree with this statement and ask the Examiner to provide them with a reference supporting his objection. If, for example, the Examiner could provide a definition which inherently excludes ice as a transparent substance, regardless of its shape, configuration, temperature,

clarity, chemical composition, or other physical or chemical characteristic, the Applicants will be happy to amend the claim. In the absence of such a showing, however, and in view of the vernacular use of the word "transparent," the Applicants stand by their belief that ice is a transparent substance.

Regarding claim 8, the Examiner alleged that it was unclear how the temperature of ice could be reduced. The Applicants have reviewed basic heat transfer texts and believe that it can be reduced by radiation from a warmer surface (the ice) to a cooler surface; by convection, by surrounding the warmer ice with a cooler gas or liquid, or by conduction from the warmer solid ice to a cooler solid in contact with the ice. These three mechanisms of heat transfer (convection, conduction and radiation) are commonly taught to engineering students in their sophomore or junior undergraduate years.

Regarding claims 12 and 22, the Examiner stated that "Nd(Yag)" should read -- Nd:YAG -- . The claims and the specification have been amended accordingly.

Regarding claim 20, the Examiner stated that the claim appears to be incomplete. Claim 20 has been amended accordingly to more clearly point out the generation of the temperature distribution.

Regarding claim 21, the Examiner suggested that a comma should be removed. Claim 21 has been amended accordingly.

Regarding claim 25, the Examiner stated that it was unclear whether the phrase following the recitation of "capable of" was intended to be patentably limiting. Claim 25 has been amended to eliminate the phrase "capable of" and to further clarify the claim.

Regarding claim 26 the Examiner stated that the word "passed" should read -- passes -- . The claim has been amended accordingly.

Regarding claims 27 and 28, the Examiner stated that the phrase "the delay time" lacks antecedent basis. The dependence of these claims has been amended to provide that antecedent basis.

Regarding claim 29, the Examiner stated that the phrase "cooling means" lacks antecedent basis. The dependence of claim 29 has been amended to provide that antecedent basis.

Regarding claim 39, the Examiner stated that the claim appears to be incomplete "since none of the claimed steps relate to cutaneous resurfacing." Claim 39 has been amended to more particularly point out the cutaneous resurfacing.

Regarding claims 43 and 47, the Examiner stated that the claims appear incomplete, "since none of the

claimed elements relate to cutaneous resurfacing." Claims 43 and 47 have been amended to more particularly point out the cutaneous resurfacing.

For the foregoing reasons the Applicants respectfully request that the Examiner withdraw the rejection of claims 1-19, 21-43 and 45-47 under 35 U.S.C. § 112, second paragraph.

In paragraph 4 of the Office Action, the Examiner rejected claims 1, 2, 14-16, and 18-20 under 35 U.S.C. § 102(b) as being clearly anticipated by Ghaffari. The Applicants traverse this rejection of the claims.

In accordance with claim 1, the Applicants claim a method of smoothing wrinkles in a region of wrinkled skin by (among other steps) applying pulsed light to a surface of the skin and heating collagen in the skin to a temperature that will shrink the collagen sufficiently to reduce the wrinkles.

The Ghaffari reference is directed to a system for the treatment of vascular lesions that involves applying radiation to the skin at wavelengths and energy levels selected to cause the coagulation of blood flowing in blood vessels under the surface of the treated skin.

The Ghaffari reference does not disclose the application of radiation to wrinkled skin, nor to heating

the collagen in the skin sufficiently to reduce the wrinkles in the skin.

For the above reason the Applicants respectfully request the Examiner to withdraw his rejection of claim 1 and all claims dependent upon claim 1 (claims 2, 14-16, and 18-19) under 35 U.S.C. § 102(b) based upon Ghaffari. The rejection of claim 20 is moot since claim 20 has been canceled herein.

In paragraph 6 of the Office Action, the Examiner rejected claims 1, 2, 10-14, 17, 25, 30-34 and 37-47 under 35 U.S.C. § 103(a) as being unpatentable over Freiberg. The grounds for the rejection of claim 1 were that:

... one of ordinary skill in the art at the time of the invention would recognize that operation of the device of Freiberg will heat and shrink collagen, and therefore the device is "capable of heating collagen and shrinking the collagen" as set forth in the claim.

Claim 1 has been amended to remove the "capable of ..." recitation and now calls for heating collagen in the region of wrinkled skin to a temperature that will shrink the collagen sufficiently to reduce the wrinkles. Freiberg is directed to a device for multiplexing several therapeutic lasers, including tissue cutting, tissue ablating, tissue coagulating and tissue anastomosing (tissue fusing) lasers. Freiberg does not disclose or suggest wrinkle smoothing, nor of heating collagen in

wrinkled skin to a temperature that will shrink the collagen sufficient to reduce wrinkling in the wrinkled skin. For at least the above reason the Applicants respectfully request that the Examiner withdraw his rejection of claim 1 and all claims dependent thereon (claims 2, 10-14 and 17).

Claim 25 is directed to a treatment apparatus including (among other things) a pulsed light source for heating and shrinking collagen in wrinkled skin sufficient to reduce wrinkles in the region of skin. Freiberg does not disclose or suggest wrinkle smoothing, nor of heating collagen in wrinkled skin to a temperature that will shrink the collagen sufficient to reduce wrinkles in the region of skin. For at least the above reason the Applicants respectfully request that the Examiner withdraw his rejection of claim 25 and all claims dependent thereon (claims 30-34 and 37-38).

Claim 39 is directed to a method of cutaneous resurfacing of a region of skin by removing at least an outer layer of skin in the region. The steps for performing this method include producing Er:YAG laser light, directing the light to the region of skin for a duration and with an intensity sufficient to remove an outer layer of skin, waiting for a period of time not less than the thermal relaxation time of the skin, and repeating the step of directing the light.

The Freiberg reference does not disclose at least the use of Er:YAG light for cutaneous resurfacing of skin, nor the use of successive pulses with a wait in between related to the thermal relaxation time of the skin. Nor would one expect the Freiberg reference to suggest these features, since Freiberg is directed to surgical lasers, and not to lasers used for cosmetic purposes.

For at least the above reasons, the Applicants respectfully request that the Examiner withdraw the rejection of claim 39 and all claims dependent upon claim 39 (claims 40-42) under 35 U.S.C. 103(a) based upon Freiberg.

Claim 43 is directed to an apparatus for skin rejuvenation by removing at least an outer layer of skin in a region of skin. This apparatus includes an Er:YAG laser light source disposed in a housing capable of directing light to the region of skin for a duration and with an intensity sufficient to remove the outer layer and a pulse delay circuit for providing a delay between sequential pulses of Er:YAG light for a period of time not less than the thermal relaxation time of the skin. The Freiberg reference is not directed to a process of skin rejuvenation, a fundamentally cosmetic application, but to surgical applications. (Col. 1, lines 38-44: "Clearly there exists a need for a surgical tool

Accordingly, I have invented a medical system ... to allow a physician to precisely incise, vaporize, anastomose and coagulate ... tissues during surgery") For this reason, Freiberg understandably does not discuss the benefits of waiting for a period of time equal to the thermal relaxation time of the skin being rejuvenated between sequential pulses. While the Examiner is correct inasmuch as the "pulse and repetition rate [of the Er:YAG laser] can be controlled independently of the Nd:YAG source" (col. 6, lines 23-25) there is no mention of controlling a delay time between each of the sequential pulses. Furthermore, since the Er:YAG laser is taught to be used as a "precise cutting tool" (col. 6, line 17) to "cut both bone and soft tissue" (col. 6, lines 20-21) or to "remove larger volumes of material" (col. 6, line 23) there is no suggestion to use the Er:YAG device for purposes of skin rejuvenation, generally. Thus one skilled in the art would have no expectation of success in using the Er:YAG laser for skin rejuvenation with the claimed pulse delays.

For at least the above reasons, the Applicants respectfully request that the Examiner withdraw his rejection of claim 43 and all claims dependent thereon (claims 45 and 46) under 35 U.S.C. § 103(a) as being unpatentable under Freiberg.

Claim 47 is directed to an apparatus for cutaneous resurfacing skin, including skin resurfacing or wrinkle smoothing including an incoherent light source for generating incoherent light for heating collagen to a temperature sufficient to reduce wrinkling, an Er:YAG laser which can be operated in multiple pulse mode for generating laser light, and a delivery system disposed to deliver the incoherent light and laser light to the skin. The Freiberg reference, as recited above, is directed to a surgical system including multiplexed laser light sources for cutting, ablating, anastomosing and coagulating applications. The Freiberg reference does not teach a combined system for cutaneous resurfacing of skin, nor does it teach an incoherent light source for treatment. Since the claimed function of the incoherent light source is for heating the skin to temperatures sufficient to reduce wrinkling, and it is not claimed to ablate, cut, anastomose nor coagulate skin, and since these last four are the only therapeutic functions taught by the Freiberg reference, the Freiberg reference cannot be said to either teach or suggest the incoherent light source of claim 47.

For at least the above reasons, the Applicants respectfully request that the Examiner withdraw his rejection of claim 47 under 35 U.S.C. § 103(a) as being unpatentable under Freiberg.

In paragraph 7 of the Office Action, the Examiner identified claims 3-9, 21-24, 26-29, 35 and 36 as allowable if rewritten to overcome the rejections under 35 U.S.C. § 112 set forth in the Office Action and to include all of the limitations of the base claim and any intervening claims. These claims have been so amended, and the Applicants respectfully request that the Examiner withdraw his rejection of the claims under 35 U.S.C. § 112. Note, however, that several of the claims have been amended to state that the epidermis is cooled and not the epidermis and outer layers. This more correctly reflects the actual cooling process in the preferred embodiment in which a cooling medium is applied to the epidermis.

Regarding the Hennings, et al. reference, which is directed to shrinking a tympanic membrane, and is identified by the Examiner as "pertinent" to the Applicants' disclosure, the Applicants note that a tympanic membrane is not comprised of skin, nor is the process described in the Hennings, et al. reference directed to reducing wrinkling of the tympanic membrane. Unlike a tympanic membrane, which has no space, skin has blood vessels which are subject to coagulation, and is comprised of and is supported by living tissue both of which are subject to cellular damage due to heating. Based upon these significant differences, and in the

absence of any other showing of structural or other similarity between slack tympanic membranes and wrinkled skin, the Applicants do not consider that the Hennings, et al. reference would suggest the claimed invention to one of ordinary skill in the art.

In view of the above claims 1-19, 21-43 and 45-47 of this application are now considered to be in condition for allowance and an early notice to that effect would be appreciated. Any inquiries with respect to this application should be directed to the undersigned at the telephone number below.

Respectfully submitted,



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